I claim the following:

1. In an aerial refueling system for refueling a receiver aircraft in flight from a tanker aircraft, wherein the refueling system includes a hose reel rotatably mounted on the tanker aircraft's fuselage, a hose wound around the reel, said hose having an outlet end, and a drogue affixed to said outlet end, a hose reel drive system comprising:

a variable displacement hydraulic motor having an electro-hydraulic control valve and having an output shaft connected to said reel;

a reaction torque sensor which measures the torque imposed on said reel through said drogue and hose;

a tachometer/position sensor which detects the movement of said hose; and

a microprocessor electrically connected to said electro-hydraulic control valve, said reaction torque sensor, and said tachometer/position sensor.

2. The aerial refueling system of Claim 1 wherein said reaction torque sensor is connected between said fuselage and said variable displacement hydraulic motor.

3. The aerial refueling system of Claim 2 wherein said tachometer/position sensor is connected to said reel.

4. A method for deploying a hose and drogue for aerial refueling of a receiver aircraft from a tanker aircraft, wherein said tanker aircraft includes a refueling system having a hose reel, with the hose wound around the reel, mounted on the tanker aircraft's fuselage such that said reel may rotate in a hose extension direction or in a hose retraction direction, said hose having an outlet end with said drogue affixed to said outlet end, said method comprising the following steps:

(a) connecting the hose reel to a variable displacement hydraulic motor's output shaft, said motor having an electro-hydraulic control valve which controls said motor's displacement, the displacement of said motor being approximately zero when said hose and drogue are stowed in the tanker aircraft's fuselage;

(b) upon receipt of a deploy command, maintaining said motor's displacement at approximately zero and ejecting the drogue from said fuselage into an air stream and allowing said air stream to pull said drogue so that the hose unwinds from said hose reel and the hose reel rotates in the hose extension direction;

(c) sensing the hose's speed;

(d) sensing the hose's length which is unwound from said hose reel;

(e) when said hose length reaches a first predetermined length, setting said motor's displacement so that said motor allows the hose reel to continue to rotate in the hose extension direction with the hose unwinding from said reel at a speed up to a first predetermined hose extension speed;

(f) when said hose length approaches a second predetermined length, setting said motor's displacement so that the hose extension speed approaches zero;

(g) when said hose length reaches said second predetermined length, setting said motor's displacement so that the motor maintains said hose speed at zero;

(h) waiting a predetermined time period after said hose speed is zero when said hose length is said second predetermined length and then sensing the reaction torque on the hose reel (said reaction torque on said hose reel when said hose speed is zero at said second predetermined length being referred to as "free trail drag force"), and storing data relating to said free trail drag force;

(i) continuing to sense said reaction torque after said receiver aircraft's probe engages said drogue (said reaction torque after said receiver aircraft's probe engages said drogue being referred to as "net drag force");

(j) comparing said net drag force to said free trail drag force, and continuing to set said motor's displacement so that the motor continues to maintain said hose speed at zero until said net drag force is less than a first predetermined percentage of said free trail drag force;

(k) when said net drag force is less than said first predetermined percentage of said free trail drag force, setting said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to a predetermined maximum allowable hose speed;

(l) continuing to set said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed until said net drag force has increased to at least as great as said first predetermined percentage of said free trail drag force; and

(m) after said net drag force has increased to at least as great as said first predetermined percentage of said free trail drag force, setting said motor's displacement so that the motor

(i) maintains said hose speed at zero so long as said net drag force is at least as great as said first predetermined percentage of said free trail drag force and no greater than a second predetermined percentage of said free trail drag force;

(ii) causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed when said net drag force drops below said first predetermined percentage of said free trail drag force;

(iii) allows said hose reel to rotate in the hose extension direction with the hose unwinding from said reel at up to said predetermined maximum allowable hose speed when said net drag force exceeds said second predetermined percentage of said free trail drag force;

until said hose is maneuvered to a third predetermined length, which is less than the second predetermined length and greater than the first predetermined length, at which time said drogue and hose are in a refueling mode position.

5. The method of Claim 4, including the following additional steps:

(n) after said drogue and hose are in said refueling mode position, setting said motor's displacement so that the motor

(i) maintains said hose speed at zero so long as said net drag force is at least as great as said first predetermined percentage of said free trail drag force and no greater than said second predetermined percentage of said free trail drag force;

(ii) causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed when said net drag force drops below said first predetermined percentage of said free trail drag force;

(iii) allows said hose reel to rotate in the hose extension direction with the hose unwinding from said reel at up to said predetermined maximum allowable hose speed when said net drag force exceeds said second predetermined percentage of said free trail drag force;

until said hose is maneuvered to said second predetermined length;

(o) after said hose is maneuvered to said second predetermined length after having been in said refueling mode position, setting said motor's displacement so that the motor causes the hose speed to be reduced to zero;

(p) upon receipt of a retraction command, setting said motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at a second predetermined retraction speed;

(q) after receipt of said retraction command and after sensing that said hose length has returned to said first predetermined length, setting the motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction at a rate which reduces the speed at which said hose retracts; and

(r) setting said motor's displacement to zero when said hose length is zero.

6. The method of Claim 4, including the following additional steps:

A. monitoring said tanker aircraft's air speed;

B. comparing said tanker aircraft's instant air speed to what was said tanker aircraft's air speed when said free trail drag force was sensed; and

C. calculating a new free trail drag force based on a change, if any, in said tanker aircraft's air speed.

7. The method of Claim 4, including the following additional steps:

A. after the first time that the hose reaches the second predetermined length and before said receiver aircraft's probe engages said drogue, setting said motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed until said hose approaches a fourth predetermined length;

B. sensing whether or not said hose has approached said fourth predetermined length; and

C. if said hose length has approached said fourth predetermined length,

(i) setting said motor's displacement so that the motor causes the hose speed to be reduced to zero;

(ii) then setting said motor's displacement so that said motor allows the hose reel to rotate in the hose extension direction with the hose unwinding from said reel at a speed up to said first predetermined hose extension speed;

(iii) then continuing with steps (g) through (m) of Claim 4, and

(iv) issuing a begin engagement signal to said receiver aircraft after step (h) of Claim 4.

8. A method for deploying a hose and drogue for aerial refueling of a receiver aircraft from a tanker aircraft, wherein said tanker aircraft includes a refueling system having a hose reel, with the hose wound around the reel such that said reel may rotate in a hose extension direction or in a hose retraction direction, said hose having an outlet end with said drogue affixed to said outlet end, said method comprising the following steps:

(a) connecting the hose reel to a variable displacement hydraulic motor's output shaft, said motor's displacement being approximately zero when said hose and drogue are stowed in the tanker aircraft;

(b) upon receipt of a deploy command, maintaining said motor's displacement at approximately zero and ejecting the drogue from said tanker aircraft into an air stream and allowing said air stream to pull said drogue so that the hose unwinds from said hose reel and the hose reel rotates in the hose extension direction;

(c) sensing the hose's speed;

(d) sensing the hose's length which is unwound from said hose reel;

(e) when said hose length reaches a first predetermined length, setting said motor's displacement so that said motor allows the hose reel to continue to rotate in the hose extension direction with the hose unwinding from said reel;

(f) when said hose length approaches a second predetermined length, setting said motor's displacement so that the hose extension speed approaches zero;

(g) when said hose length reaches said second predetermined length, setting said motor's displacement so that the motor maintains said hose speed at zero;

(h) waiting a predetermined time period after said hose speed is zero when said hose length is said second predetermined length and then sensing the reaction torque on the hose reel (said reaction torque on said hose reel when said hose speed is zero at said second predetermined length being referred to as "free trail drag force"), and storing data relating to said free trail drag force;

(i) continuing to sense said reaction torque after said receiver aircraft's probe engages said drogue (said reaction torque after said receiver aircraft's probe engages said drogue being referred to as "net drag force");

(j) comparing said net drag force to said free trail drag force, and continuing to set said motor's displacement so that the motor continues to maintain said hose speed at zero until said net drag force is less than a first predetermined percentage of said free trail drag force;

(k) when said net drag force is less than said first predetermined percentage of said free trail drag force, setting said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to a predetermined maximum allowable hose speed;

(l) continuing to set said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed until said net drag force has increased to at least as great as said first predetermined percentage of said free trail drag force; and

(m) after said net drag force has increased to at least as great as said first predetermined percentage of said free trail drag force, setting said motor's displacement so that the motor

(i) maintains said hose speed at zero so long as said net drag force is at least as great as said first predetermined percentage of said free trail drag force and no greater than a second predetermined percentage of said free trail drag force;

(ii) causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed when said net drag force drops below said first predetermined percentage of said free trail drag force;

(iii) allows said hose reel to rotate in the hose extension direction with the hose unwinding from said reel at up to said predetermined maximum allowable hose speed when said net drag force exceeds said second predetermined percentage of said free trail drag force;

until said hose is maneuvered to a third predetermined length, which is less than the second predetermined length and greater than the first predetermined length, at which time said drogue and hose are in a refueling mode position.

9. The method of Claim 8, including the following additional steps:

(n) after said drogue and hose are in said refueling mode position, setting said motor's displacement so that the motor

(i) maintains said hose speed at zero so long as said net drag force is at least as great as said first predetermined percentage of said free trail drag force and no greater than said second predetermined percentage of said free trail drag force;

(ii) causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed when said net drag force drops below said first predetermined percentage of said free trail drag force;

(iii) allows said hose reel to rotate in the hose extension direction with the hose unwinding from said reel at up to said predetermined maximum allowable hose speed when said net drag force exceeds said second predetermined percentage of said free trail drag force;

until said hose is maneuvered to said second predetermined length;

(o) after said hose is maneuvered to said second predetermined length after having been in said refueling mode position, setting said motor's displacement so that the motor causes the hose speed to be reduced to zero;

(p) upon receipt of a retraction command, setting said motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel;

(q) after receipt of said retraction command and after sensing that said hose length has returned to said first predetermined length, setting the motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction at a rate which reduces the speed at which said hose retracts; and

(r) setting said motor's displacement to zero when said hose length is zero.

10. The method of Claim 8, including the following additional steps:

A. monitoring said tanker aircraft's air speed;

B. comparing said tanker aircraft's instant air speed to what was said tanker aircraft's air speed when said free trail drag force was sensed; and

C. calculating a new free trail drag force based on a change, if any, in said tanker aircraft's air speed.

11. The method of Claim 8, including the following additional steps:

A. after the first time that the hose reaches the second predetermined length and before said receiver aircraft's probe engages said drogue, setting said motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed until said hose approaches a fourth predetermined length;

B. sensing whether or not said hose has approached said fourth predetermined length; and

C. if said hose length has approached said fourth predetermined length,

(i) setting said motor's displacement so that the motor causes the hose speed to be reduced to zero;

(ii) then setting said motor's displacement so that said motor allows the hose reel to rotate in the hose extension direction with the hose unwinding from said reel at a speed up to said first predetermined hose extension speed;

(iii) then continuing with steps (g) through (m) of Claim 8, and

(iv) issuing a begin engagement signal to said receiver aircraft after step (h) of Claim 8.

12. A method for controlling the deployment of a hose and drogue during aerial refueling of a receiver aircraft from a tanker aircraft, wherein said tanker aircraft includes a refueling system having a hose reel, with the hose wound around the reel such that said reel may rotate in a hose extension direction or in a hose retraction direction, said hose having an outlet end with said drogue affixed to said outlet end, said method comprising the following steps:

(a) connecting the hose reel to a variable displacement hydraulic motor's output shaft;

(b) sensing the reaction torque on said hose reel when said receiver aircraft's probe is engaged with said drogue;

(c) setting said motor's displacement so that the motor

(i) maintains said hose speed at zero so long as said reaction torque is between first and second amounts;

(ii) causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel when said reaction torque drops below said first amount;

(iii) allows said hose reel to rotate in the hose extension direction with the hose unwinding from said reel when said reaction torque exceeds said second amount.

13. A method for controlling the deployment a hose and drogue during aerial refueling of a receiver aircraft from a tanker aircraft, wherein said tanker aircraft includes a refueling system having a hose reel, with the hose wound around the reel such that said reel may rotate in a hose

extension direction or in a hose retraction direction, said hose having an outlet end with said drogue affixed to said outlet end, said method comprising the following steps:

(a) monitoring said tanker aircraft's air speed and storing air speed data relating to said air speed;

(b) after a predetermined length of hose has unwound from said reel, bringing said hose reel's rotation to a halt;

(c) sensing the reaction torque on the hose reel a predetermined period of time after said hose reel's rotation has been halted (said reaction torque on said hose reel after said hose reel's rotation has been halted being referred to as "free trail drag force"), and storing free trail drag force data relating to said free trail drag force;

(d) comparing said tanker aircraft's instant air speed to what was said tanker aircraft's air speed when said free trail drag force was initially sensed;

(e) calculating a recalculated free trail drag force based on a change, if any, in said tanker aircraft's air speed;

(f) continuing to sense said reaction torque after said receiver aircraft's probe engages said drogue (said reaction torque after said receiver aircraft's probe engages said drogue being referred to as "net drag force");

(g) comparing said net drag force to said recalculated free trail drag force, and continuing to hold the rotation of said hose reel at a halt until said net drag force is less than a first predetermined percentage of said recalculated free trail drag force;

(h) when said net drag force is less than said first predetermined percentage of said recalculated free trail drag force, rotating said hose reel in the hose retraction direction;

(i) continuing to rotate said hose reel in the hose retraction direction with the hose winding on said reel until said net drag force has increased to at least as great as said first predetermined percentage of said recalculated free trail drag force; and

(j) after said net drag force has increased to at least as great as said first predetermined percentage of said recalculated free trail drag force,

(i) holding said hose speed's rotation at a halt so long as said net drag force is at least as great as said first predetermined percentage of said recalculated free trail drag force and no greater than a second predetermined percentage of said recalculated free trail drag force;

(ii) rotating said hose reel in the hose retraction direction with the hose winding on said reel when said net drag force drops below said first predetermined percentage of said recalculated free trail drag force; and

(iii) allowing said hose reel to rotate in the hose extension direction with the hose unwinding from said reel when said net drag force

exceeds said second predetermined percentage of said recalculated free trail drag force.

14. A method for deploying a hose and drogue during aerial refueling of a receiver aircraft from a tanker aircraft, wherein said tanker aircraft includes a refueling system having a hose reel, with the hose wound around the reel such that said reel may rotate in a hose extension direction or in a hose retraction direction, said hose having an outlet end with said drogue affixed to said outlet end, said method comprising the following steps:

(a) ejecting the drogue from said tanker aircraft into an air stream and allowing said air stream to pull said drogue so that the hose unwinds from said hose reel and the hose reel rotates in the hose extension direction;

(b) after a predetermined length of hose has unwound from said reel for a first time and before said receiver aircraft's probe engages said drogue, rotating said hose reel in the hose retraction direction with the hose winding on said reel until said hose approaches a predetermined test length which is shorter than said predetermined length;

(c) sensing whether or not said hose has approached said predetermined test length; and

(d) if said hose length has approached said predetermined test length, allowing the hose reel to rotate in the hose extension direction with the hose unwinding from said reel until at least said predetermined length of hose has unwound from said reel for a second time.

15. An aerial refueling system for refueling a receiver aircraft in flight from a tanker aircraft, said aerial refueling system comprising,

a rotatable hose reel;

a hose wound around the reel, said hose having an outlet end, and a drogue affixed to said outlet end, and

a hose reel drive system comprising:

a variable displacement hydraulic motor having an electro-hydraulic control valve and having an output shaft connected to said reel;

a reaction torque sensor which measures the torque imposed on said reel through said drogue and hose;

a tachometer/position sensor which detects the movement of said hose; and

a microprocessor electrically connected to said electro-hydraulic control valve, said reaction torque sensor, and said tachometer/position sensor.

16. A method for deploying a hose and drogue for aerial refueling of a receiver aircraft from a tanker aircraft, wherein said tanker aircraft includes a refueling system having a hose reel, with the hose wound around the reel, mounted on the tanker aircraft's fuselage such that said reel may rotate in a hose extension direction or in a hose retraction direction, said hose having an outlet end with said drogue affixed to said outlet end, said method comprising the following steps:

(a) connecting the hose reel to a variable displacement hydraulic motor's output shaft, said motor having an electro-hydraulic control valve which controls said motor's displacement, the displacement of said motor being approximately zero when said hose and drogue are stowed in the tanker aircraft's fuselage;

(b) upon receipt of a deploy command, maintaining said motor's displacement at approximately zero and ejecting the drogue from said fuselage into an air stream and allowing said air stream to pull said drogue so that the hose unwinds from said hose reel and the hose reel rotates in the hose extension direction;

(c) sensing the hose's speed;

(d) sensing the hose's length which is unwound from said hose reel;

(e) while said hose length is beyond a first predetermined length, and while the drogue is not in contact with a probe of a receiver aircraft, setting said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel and sensing reaction torque on the hose reel (said reaction torque on said hose reel when said hose is being retracted, without the drogue being in contact with said probe, being referred to as "free retraction drag force");

(f) after sensing said free retraction drag force, setting said motor's displacement so that said motor allows the hose reel to continue to rotate in the hose extension direction with the hose unwinding from said reel at a speed up to a first predetermined hose extension speed;

(g) when said hose length approaches a second predetermined length, setting said motor's displacement so that the hose extension speed approaches zero;

(h) when said hose length reaches said second predetermined length, setting said motor's displacement so that the motor maintains said hose speed at zero;

(i) waiting a predetermined time period after said hose speed is zero when said hose length is said second predetermined length and then sensing the reaction torque on the hose reel (said reaction torque on said hose reel when said hose speed is zero at said second predetermined length being referred to as "free trail drag force");

(j) continuing to sense said reaction torque after said receiver aircraft's probe engages said drogue (said reaction torque after said receiver aircraft's probe engages said drogue being referred to as "net drag force");

(k) comparing said net drag force to said free trail drag force, and continuing to set said motor's displacement so that the motor continues to maintain said hose speed at zero until said net drag force is less than a first predetermined percentage of said free trail drag force;

(l) when said net drag force is less than said first predetermined percentage of said free trail drag force, setting said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to a predetermined maximum allowable hose speed;

(m) continuing to set said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed until said net drag force has increased to at least as great as said free retraction drag force multiplied by a factor of K, where K is a predetermined value between approximately 0.2 and approximately 2; and

(n) after said net drag force has increased to at least as great as K multiplied by the free retraction drag force, setting said motor's displacement so that the motor

(i) maintains said hose speed at zero so long as said net drag force is at least as great as said first predetermined percentage of said free trail drag force and no greater than a second predetermined percentage of said free trail drag force;

(ii) causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed when said net drag force drops below said first predetermined percentage of said free trail drag force;

(iii) allows said hose reel to rotate in the hose extension direction with the hose unwinding from said reel at up to said predetermined maximum allowable hose speed when said net drag force exceeds said second predetermined percentage of said free trail drag force;

until said hose is maneuvered to a third predetermined length, which is less than the second predetermined length and greater than the first predetermined length, at which time said drogue and hose are in a refueling mode position.

17. The method of Claim 16, including the following additional steps:

(o) when said drogue and hose are in said refueling mode position, setting said motor's displacement so that the motor

(i) maintains said hose speed at zero so long as said net drag force is at least as great as said first predetermined percentage of said free trail drag force and no greater than said second predetermined percentage of said free trail drag force;

(ii) causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed when said net drag force drops below said first predetermined percentage of said free trail drag force;

(iii) allows said hose reel to rotate in the hose extension direction with the hose unwinding from said reel at up to said

predetermined maximum allowable hose speed when said net drag force exceeds said second predetermined percentage of said free trail drag force;

until said hose is maneuvered to said second predetermined length; and

(p) after said hose is maneuvered to said second predetermined length after having been in said refueling mode position, setting said motor's displacement so that the motor causes the hose speed to be reduced to zero.

18. The method of Claim 17, including the following additional steps:

(q) upon receipt of a retraction command, setting said motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at a second predetermined retraction speed;

(r) after receipt of said retraction command and after sensing that said hose length has returned to said first predetermined length, setting the motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction at a rate which reduces the speed at which said hose retracts; and

(s) setting said motor's displacement to zero when said hose length is zero.

19. The method of Claim 16, including the following additional steps:

A. monitoring said tanker aircraft's air speed;

B. comparing said tanker aircraft's instant air speed to what was said tanker aircraft's air speed when said free trail drag force was sensed; and

C. calculating a new free trail drag force based on a change, if any, in said tanker aircraft's air speed.

20. The method of Claim 16, including the following additional steps:

A. monitoring said tanker aircraft's air speed;

B. comparing said tanker aircraft's instant air speed to what was said tanker aircraft's air speed when said free retraction drag force was sensed; and

C. calculating a new free retraction drag force based on a change, if any, in said tanker aircraft's air speed.

21. The method of Claim 16, wherein in step (e) said free retraction drag force is sensed when said motor's displacement is set so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at a substantially constant hose speed.

22. A method for deploying a hose and drogue for aerial refueling of a receiver aircraft from a tanker aircraft, wherein said tanker aircraft includes a refueling system having a hose reel, with the hose wound around the reel such that said reel may rotate in a hose extension direction or in a hose retraction direction, said hose having an outlet end with said drogue affixed to said outlet end, said method comprising the following steps:

(a) connecting the hose reel to a variable displacement hydraulic motor's output shaft, said motor's displacement being approximately zero when said hose and drogue are stowed in the tanker aircraft;

(b) upon receipt of a deploy command, maintaining said motor's displacement at approximately zero and ejecting the drogue from said tanker aircraft into an air stream and allowing said air stream to pull said drogue so that the hose unwinds from said hose reel and the hose reel rotates in the hose extension direction;

(c) sensing the hose's speed;

(d) sensing the hose's length which is unwound from said hose reel;

(e) while said hose length is beyond a first predetermined length, and while the drogue is not in contact with a probe of a receiver aircraft, setting said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at a substantially constant hose speed and sensing reaction torque on the hose reel (said reaction torque on said hose reel when said hose is being retracted at a substantially constant speed, without the drogue being in contact with said probe, being referred to as "free retraction drag force");

(f) after sensing said free retraction drag force, setting said motor's displacement so that said motor allows the hose reel to continue to rotate in the hose extension direction with the hose unwinding from said reel;

(g) when said hose length approaches a second predetermined length, setting said motor's displacement so that the hose extension speed approaches zero;

(h) when said hose length reaches said second predetermined length, setting said motor's displacement so that the motor maintains said hose speed at zero;

(i) waiting a predetermined time period after said hose speed is zero when said hose length is said second predetermined length and then sensing the reaction torque on the hose reel (said reaction torque on said hose reel when said hose speed is zero at said second predetermined length being referred to as "free trail drag force");

(j) continuing to sense said reaction torque after said receiver aircraft's probe engages said drogue (said reaction torque after said receiver aircraft's probe engages said drogue being referred to as "net drag force");

(k) comparing said net drag force to said free trail drag force, and continuing to set said motor's displacement so that the motor continues to maintain said hose speed at zero until said net drag force is less than a first predetermined percentage of said free trail drag force;

(l) when said net drag force is less than said first predetermined percentage of said free trail drag force, setting said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to a predetermined maximum allowable hose speed;

(m) continuing to set said motor's displacement so that it causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed until said net drag force has increased to at least as great as said free retraction drag force multiplied by a factor

of K, where K is a predetermined value between approximately 0.2 and approximately 2; and

(n) after said net drag force has increased to at least as great as K multiplied by the free retraction drag force, setting said motor's displacement so that the motor

(i) maintains said hose speed at zero so long as said net drag force is at least as great as said first predetermined percentage of said free trail drag force and no greater than a second predetermined percentage of said free trail drag force;

(ii) causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed when said net drag force drops below said first predetermined percentage of said free trail drag force;

(iii) allows said hose reel to rotate in the hose extension direction with the hose unwinding from said reel at up to said predetermined maximum allowable hose speed when said net drag force exceeds said second predetermined percentage of said free trail drag force;

until said hose is maneuvered to a third predetermined length, which is less than the second predetermined length and greater than the first predetermined length, at which time said drogue and hose are in a refueling mode position.

23. The method of Claim 23, including the following additional steps:

(o) after said drogue and hose are in said refueling mode position, setting said motor's displacement so that the motor

(i) maintains said hose speed at zero so long as said net drag force is at least as great as said first predetermined percentage of said free trail drag force and no greater than said second predetermined percentage of said free trail drag force;

(ii) causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel at up to said predetermined maximum allowable hose speed when said net drag force drops below said first predetermined percentage of said free trail drag force;

(iii) allows said hose reel to rotate in the hose extension direction with the hose unwinding from said reel at up to said predetermined maximum allowable hose speed when said net drag force exceeds said second predetermined percentage of said free trail drag force;

until said hose is maneuvered to said second predetermined length; and

(p) after said hose is maneuvered to said second predetermined length after having been in said refueling mode position, setting said motor's displacement so that the motor causes the hose speed to be reduced to zero.

24. The method of Claim 22, including the following additional steps:

(q) upon receipt of a retraction command, setting said motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction with the hose winding on said reel;

(r) after receipt of said retraction command and after sensing that said hose length has returned to said first predetermined length, setting the motor's displacement so that the motor causes said hose reel to rotate in the hose retraction direction at a rate which reduces the speed at which said hose retracts; and

(s) setting said motor's displacement to zero when said hose length is zero.

25. The method of Claim 22, including the following additional steps:

A. monitoring said tanker aircraft's air speed;

B. comparing said tanker aircraft's instant air speed to what was said tanker aircraft's air speed when said free trail drag force was sensed; and

C. calculating a new free trail drag force based on a change, if any, in said tanker aircraft's air speed.

26. The method of Claim 22, including the following additional steps:

A. monitoring said tanker aircraft's air speed;

B. comparing said tanker aircraft's instant air speed to what was said tanker aircraft's air speed when said free retraction drag force was sensed; and

C. calculating a new free retraction drag force based on a change, if any, in said tanker aircraft's air speed.

27. A method for controlling the deployment of a hose and drogue during aerial refueling of a receiver aircraft from a tanker aircraft, wherein said tanker aircraft includes a refueling system having a hose reel, with the hose wound around the reel such that said reel may rotate in a hose extension direction or in a hose retraction direction, said hose having an outlet end with said drogue affixed to said outlet end, said method comprising the following steps:

(a) after a predetermined length of hose has unwound from said reel, and while the drogue is not in contact with a probe of said receiver aircraft, rotating said hose reel in the hose retraction direction and sensing reaction torque on the hose reel (said reaction torque on said hose reel when said hose is being retracted, without the drogue being in contact with said probe, being referred to as "free retraction drag force");

(b) sensing said reaction torque after said receiver aircraft's probe engages said drogue (said reaction torque after said receiver aircraft's probe engages said drogue being referred to as "net drag force");

(c) after initial engagement of said probe with said drogue, rotating said hose reel in the hose retraction direction so that said hose is retracted;

(d) comparing said net drag force to said free retraction drag force;

(e) continuing to rotate said hose reel in the hose retraction direction with the hose winding on said reel until said net drag force has increased to at least as great as said free retraction drag force multiplied by a factor of K, where K is a predetermined value between approximately 0.2 and approximately 2; and

(g) after said net drag force has increased to at least as great as K multiplied by said free retraction drag force, halting the rotation of said hose reel.

28. The method of Claim 27 wherein the value of K is approximately 1.

29. The method of Claim 27, wherein in step (a) said free retraction drag force is sensed while rotating said hose reel in the hose retraction direction so that said hose is retracted at a substantially constant hose speed.

30. The method of Claim 29 wherein the value of K is approximately 1.

31. The method of Claim 29, including the following additional steps:

(h) while said hose length is beyond said predetermined length and before initial engagement of said probe with said drogue, causing said hose reel to cease rotating, bringing said hose speed to zero, and sensing the reaction torque on the hose reel while the drogue is not in contact with said probe (said reaction torque on said hose reel when said hose speed is zero and while the drogue is not in contact with said probe being referred to as "free trail drag force"); and

(i) after the rotation of said hose reel has been halted when said net drag force has increased to at least as great as K multiplied by said free retraction drag force,

(i) holding said hose reel's rotation at a halt so long as said net drag force is at least as great as a first predetermined percentage of said free trail drag force and no greater than a second predetermined percentage of said recalculated free trail drag force;

(ii) rotating said hose reel in the hose retraction direction with the hose winding on said reel when said net drag force drops below said first predetermined percentage of said recalculated free trail drag force; and

(iii) allowing said hose reel to rotate in the hose extension direction with the hose unwinding from said reel when said net drag force exceeds said second predetermined percentage of said recalculated free trail drag force.

32. The method of Claim 16 wherein the value of K is approximately 1.